

U.S. DEPARTMENT OF COMMERCE PATENT & TRADEMARK OFFICE

B/O Form PTO-1390		Transmittal Letter to the United States Designated/Elected Office (DO/EO/US) Concerning a Filing Under 35 USC 371	Attorney's Docket Number PLAS3002/JEK
			U.S. Application Number (if known) 09/926062
International Application Number PCT/EP00/01428	International Filing Date 22 February 2000	Priority Date Claimed 23 February 1999	
Title of Invention VALUE DOCUMENT			
Applicant(s) for DO/EO/US Reinhard PLASCHKA et al.		Assignee	

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items under 35 USC 371:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 USC 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 USC 371.
3. ☒ This express request to begin national examination procedures (35 USC 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 USC 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed 35 USC 371(c)(2).
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 USC 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 USC 371(c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 USC 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 USC 371(c)(4)). (☐ Executed ☒ Unexecuted)
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 USC 371(c)(5)).

Items 11 to 16 below concern other document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information: 5 sheets formal drawings

Application Number (if Known) 09/926062		International Application Number PCT/EP00/01428		Attorney's Docket Number PLAS3002/JEK	
				Calculations	PTO USE ONLY
17. The following fees are submitted: Basic National Fee (37 CFR 1.492(a)(1)-(5)): <input checked="" type="checkbox"/> Search report has been prepared by the EPO or JPO \$860.00 <input type="checkbox"/> International Preliminary Examination Fee paid to USPTO (37 CFR 1.482) \$690.00 <input type="checkbox"/> No International Preliminary Examination Fee paid to USPTO (37 CFR 1.482) but International Search Fee paid to USPTO (37 CFR 1.445(a)(2)) \$710.00 <input type="checkbox"/> Neither International Preliminary Examination Fee (37 CFR 1.482) nor International Search Fee (37 CFR 1.445(a)(2)) paid to USPTO \$1000.00 <input type="checkbox"/> International Preliminary Examination Fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00					
ENTER APPROPRIATE BASIC FEE AMOUNT				\$ 860.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).					
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total Claims	37 -20 =	17	× \$18.00	\$ 306.00	
Independent Claims	8 -3 =	5	× \$80.00	\$ 400.00	
Multiple Dependent Claims (if applicable)			+ \$270.00	\$ 270.00	
TOTAL OF ABOVE CALCULATIONS				\$ 1,836.00	
Reduction by ½ for filing by small entity, if applicable. Small Entity Status is asserted pursuant to 37 CFR 1.27 for this application.					
SUBTOTAL				\$ 1,836.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).					
TOTAL NATIONAL FEE				\$ 1,836.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property.					
TOTAL FEES ENCLOSED				\$ 1,836.00	
Amount to be:				Refunded:	
				Charged:	

a. ☒ A check in the amount of \$1,836.00 to cover the fees is enclosed.

b. ☐ Please charge my Deposit Account Number 02-0200 in the amount of \$_____ to cover the above fees.
A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account Number 02-0200. A duplicate copy of this sheet is enclosed.

Note: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.



Customer 23364

BACON & THOMAS, PLLC
625 SLATERS LANE - FOURTH FLOOR
ALEXANDRIA, VIRGINIA 223124-1176
(703) 683-0500

DATE: 16 August 2001

Respectfully submitted,

[Signature]
J. Ernest Kenney
Attorney for Applicant

Registration Number: 19,179

Application Number (if Known) 09/926062		International Application Number PCT/EP00/01428		Attorney's Docket Number PLAS3002/JEK	
				Calculations	PTO USE ONLY
17. The following fees are submitted: Basic National Fee (37 CFR 1.492(a)(1)-(5)): <input checked="" type="checkbox"/> Search report has been prepared by the EPO or JPO \$860.00 <input type="checkbox"/> International Preliminary Examination Fee paid to USPTO (37 CFR 1.482) \$690.00 <input type="checkbox"/> No International Preliminary Examination Fee paid to USPTO (37 CFR 1.482) but International Search Fee paid to USPTO (37 CFR 1.445(a)(2)) \$710.00 <input type="checkbox"/> Neither International Preliminary Examination Fee (37 CFR 1.482) nor International Search Fee (37 CFR 1.445(a)(2)) paid to USPTO \$1000.00 <input type="checkbox"/> International Preliminary Examination Fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00					
ENTER APPROPRIATE BASIC FEE AMOUNT				\$ 860.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).					
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total Claims	37 -20 =	17	× \$18.00	\$ 306.00	
Independent Claims	8 -3 =	5	× \$80.00	\$ 400.00	
Multiple Dependent Claims (if applicable)			+ \$270.00	\$ 270.00	
TOTAL OF ABOVE CALCULATIONS				\$ 1,836.00	
Reduction by ½ for filing by small entity, if applicable. Small Entity Status is asserted pursuant to 37 CFR 1.27 for this application.					
SUBTOTAL				\$ 1,836.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).					
TOTAL NATIONAL FEE				\$ 1,836.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property.					
TOTAL FEES ENCLOSED				\$ 1,836.00	
			Amount to be:	Refunded:	
				Charged:	

- a. ☒ A check in the amount of **\$1,836.00** to cover the fees is enclosed.
- b. ☐ Please charge my Deposit Account Number 02-0200 in the amount of \$ to cover the above fees.
A duplicate copy of this sheet is enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account Number 02-0200. A duplicate copy of this sheet is enclosed.

Note: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.



Customer 23364

BACON & THOMAS, PLLC
 625 SLATERS LANE - FOURTH FLOOR
 ALEXANDRIA, VIRGINIA 223124-1176
 (703) 683-0500

DATE: 16 August 2001

Respectfully submitted,

[Signature]
 J. Ernest Kenney
 Attorney for Applicant
 Registration Number: 19,179

Document of value

This invention relates to a document of value such as a paper of value or ID card with a security element having an optically variable material that conveys different color effects at different viewing angles. The invention further relates to a foil, a multilayer transfer material and a printing ink with such an optically variable material.

In view of the high quality of color copies it is necessary to provide documents of value such as bank notes, ID cards or the like with additional security elements that are uncopiable or not copiable true to the original. For this purpose one frequently uses optically variable devices such as holograms, interference layer elements or liquid-crystal materials that convey different color effects at different viewing angles. The interplay of colors of said devices constitutes a very striking, visually easily recognized security feature so that a photocopy not having said interplay of colors can be distinguished from an original document very easily even by a layman. However, optically variable devices are accessible to machine testing only under certain conditions and with high technical effort.

EP 0 435 029 B1 describes a document of value with an optically variable, liquid-crystal security feature. One uses as security elements in particular liquid-crystal polymers that constitute a plastic-like solid with a distinctive color change at room temperature after suitably oriented production. They can be used to produce different types of security elements. One can thus coat plastic foils with a layer of liquid-crystal polymers and then cut the resultant sheet of material into narrow bands or threads that can be embedded in paper or other materials as security threads. It is also proposed in EP 0 435 029 B1 to produce transfer bands containing in their layer structure a layer of liquid-crystal polymers. Besides optically variable properties, liquid-crystal materials also possess light-polarizing properties that are exploited to make the security element additionally accessible to machine testing. Since light polarization is only a weak effect that is greatly impaired by environmental influences such as dirt, folds or bends in the document of value, however, the measuring effort for reliable automated testing is very high.

The invention is therefore based on the problem of proposing a document of value with an optically variable security element having not only a visually well recognized optically variable effect but also improved machine-readability.

The invention is based on the surprisingly simple idea of not improving the machine-readability of the optically variable material itself but combining the optically variable material with at least one feature substance that is easily and reliably machine-readable while not impairing the visually visible, optically variable effect of the optically variable material. Accordingly, the inventive security element has an optically variable material that conveys different color effects at different viewing angles, and a feature substance that does not impair the visually visible, optically variable effect of the optically variable material and is machine-testable. The security element can be prepared as a separate element and then connected with the object of value to be protected, or produced directly on the object of value, for example in the form of a printed image.

As a feature substance one can use for example luminescent substances, electrically conductive polymers or carbon blacks, IR-absorbent substances, but also magnetic materials or thermochromic materials. Preferably, one uses feature substances transparent in the visible spectral region.

In the case of luminescent substances, suitable ones are specifically substances luminescing outside the visible spectral region with narrow emission bands that are very well detectable by machine. One preferably uses inorganic luminescent substances, but depending on the application it may also be expedient to use other luminescent substances.

Magnetic materials frequently possess a black or dark inherent color. If the quantity concentration is accordingly dosed, however, they can nevertheless be used very advantageously as a feature substance in accordance with the invention. The dark magnetic materials absorb the diffuse stray radiation in the surroundings of the optically variable material, thereby strengthening the brilliance of the optically variable effect.

As an optically variable material one can use for example liquid-crystal materials, preferably liquid-crystal polymer materials or also interference layer materials.

It has proved especially advantageous if the optically variable material is present in the form of pigments or particles with a suitable particle size, distribution and shape factor since the latter can be admixed to any other materials. One can choose between pigments with body color and ones without body color. The latter are largely transparent so that their color effect is greatly codetermined by the background. But one can also use microencapsulated liquid crystals.

According to a preferred embodiment, the security element consists of a color layer applied at least in partial areas of the document of value. The color layer consists at least of a binder and liquid-crystal pigments dispersed therein as well as feature substances. If the color layer is applied by a printing process, for example screen printing, flexography or intaglio printing, the printing ink contains optically variable pigments in 10 to 30 wt% and feature substance in 0.01 to 30 wt% based on the binder, depending on the feature substance used. If the feature substance used is a luminescent substance, one adds 0.01 to 30 wt%, preferably 0.01 to 10 wt%, in the case of magnetic materials 5 to 80 wt%, preferably 10 to 20 wt%. If electrically conductive polymers are used for the feature substance, the electrically conductive polymer can also form the binder of the color layer.

Alternatively, the security element can also be present in the form of a thread or band that is either disposed completely on the surface of the document of value or freely accessible only partially on the surface of the document of value as a so-called window security thread. The security element in this case has a plastic material containing for example the optically variable material and feature substance. Alternatively, one can apply a color layer containing the optically variable material and feature substance to the plastic material at least in certain areas. According to another variant, the security element has an electrically conductive plastic material on or in which the optically variable material is disposed.

According to another embodiment of the invention, the security element can also consist of a plastic foil containing the optically variable material and feature substance. Said plastic foil can be used for example as a protective layer for certain areas of the document of value or as an all-over cover foil, for example in the case of ID cards.

It is likewise possible to add the optically variable material and feature substance to plastic pellets that are then processed into finished plastic parts. This can be done for example by extrusion or injection molding.

Finally, it is also possible to form the security element as a multilayer transfer element in whose layer structure the optically variable material and feature substance are disposed. The transfer element can be executed as a self-supporting label consisting of a carrier layer on or in which the optically variable layer and feature substance are disposed. Alternatively, the transfer element can have no carrier layer. In this case the transfer element is produced with the aid of a hot stamping foil whose carrier band is removed after transfer of the transfer element, i.e. the security element.

Feature substance and optically variable material need not fundamentally be applied simultaneously to the object of value, however. One can for example first apply the feature substance and then dispose the optically variable material thereover. This procedure is especially advantageous if the feature substance used is dark magnetic material or electrically conductive carbon black and the optically variable material is largely transparent material without, or with little, body color. In this case the feature substance is first applied in the form of a printed image and then in the same area a layer of optically variable material that may also cover gaps present in the printed image of the feature substance. Since the dark background absorbs the radiation passing through the optically variable material as well as stray radiation, the optically variable effect is especially evident in the area of the magnetic printed image.

The forgery-proofness of this security element can be additionally increased if a magnetic material is used as the feature substance and carbon black is admixed to the magnetic layer. Concentrations of 1 to 5 wt% of carbon black already yield good electric conductivity that is readily detectable by machine.

Another way of additionally increasing forgery-proofness is to apply the feature substance in the form of a coding or alphanumeric information. In the simplest case, the coding is a bar code. If the coding is not to be visually visible, the surroundings of the coding can be provided in register with a camouflage layer that

cannot be distinguished visually from the coding but contains no feature substance. Such camouflaging may also be expedient if the layer containing feature substance is transparent since the layer might be recognizable at a glancing angle.

During machine testing of the security element, several different properties can be evaluated. Most optically variable materials, in particular liquid-crystal materials, are transparent in the IR spectral region. If said materials are combined with a luminescent substance transparent in the visible spectral region and emitting in the IR spectral region, the spectral response in the visible and infrared wave ranges can be evaluated to detect the optically variable material during machine testing. Simultaneously, one must test at the same place the special physical property, for example luminescence or electric conductivity of the feature substance.

If the feature substance is not transparent, one can nevertheless apply the same measuring principle. In this case one uses as a reference value the superposition of the spectra of optically variable material and feature substance in the visible spectral region.

The optically variable material can finally also be combined with thermochromic materials whose color change can be detected with a suitable optical sensor. As thermochromic materials one can use for example suitable liquid-crystal materials that show a defined color change and have short reaction times.

The forgery-proofness of the inventive security element can finally be increased further by using a plurality of optically variable materials and/or feature substances that may be disposed in the same or different layers of the security element.

If a liquid-crystal material is used as an optically variable material, additional information can also be incorporated in this layer. Liquid crystals have the property of dispersing unpolarized incident light into components with different polarization. Depending on the chemical composition of the liquid-crystal material, only one of these components is reflected. This property can be used according to the invention for representing information. For example, one can produce any desired information with a printing ink containing left-handed liquid-crystal material. The surroundings of this information is printed in register with an ink containing right-handed liquid-

crystal material. Both inks show the same appearance under normal illumination so that the information cannot be recognized under normal illumination conditions. The information only becomes recognizable when viewed through a suitable polarization filter since the radiation passing through the polarization filter is reflected only by one of the liquid-crystal materials so that a brightness contrast arises between the two printed layers.

One or both of the liquid-crystal materials can additionally have thermochromic properties so that suitable heating of said material, for example by the body heat of a finger, produces a color change that is testable by machine and/or visually.

If both liquid-crystal materials have thermochromic properties one obtains further interesting variants. For example the materials can be chosen so that they show a color change at the same temperature but the perceptible colors are different. In this way one can likewise represent information that becomes recognizable, disappears or alters its content through heating. One preferably uses materials that look the same under normal conditions and show different colors in contrast with each other through heating. It is also possible to use materials that become transparent or opaque through heating.

The additional thermochromic property can be incorporated directly via the chemical formulation of the liquid-crystal materials. For optimal control of the individual properties, however, it is also recommendable to mix a plurality of liquid-crystal materials, each of the liquid-crystal materials having a special property. That is, one can select for example two basic liquid-crystal components that have right- or left-handed properties and matching reflective behavior but are not thermochromic. These are mixed with corresponding thermochromic liquid-crystal materials.

The inventive security element can moreover be used not only for protecting documents of value such as bank notes, ID cards, passports, shares or the like, but can also be disposed on or in any desired objects to be protected, for example tickets, books, CDs, packages of any kind, etc.

Further advantages and embodiments of the invention will be explained with reference to the figures, in which:

Fig. 1 shows an inventive document of value,

Fig. 2 shows an embodiment of the inventive security element,
Fig. 3 shows another embodiment of the inventive security element,
Fig. 4 shows another embodiment of the inventive security element,
Fig. 5 shows another embodiment of the inventive security element,
Fig. 6 shows another embodiment of the inventive security element,
Fig. 7 shows another embodiment of the inventive security element,
Fig. 8 shows another embodiment of the inventive security element,
Fig. 9 shows another embodiment of the inventive security element in a front view,

Fig. 10 shows a special embodiment of an inventive liquid-crystal layer with right- and left-handed polarization properties.

Fig. 1 shows inventive security document 1 in the form of a bank note. So-called window security thread 2 is woven into said bank note, passing directly to the surface of the paper in certain areas 3. The areas of thread 2 located therebetween within the paper web are shown by dash lines in the figure. Document of value 1 additionally has print 4 produced with an inventive printing ink. Print 4 forms the inventive security element. Since one does not normally produce the entire print of the document of value with the inventive printing ink, this is a locally limited security element, as indicated by area 5 limited by dash-dotted lines in Fig. 1. If necessary, however, the entire print can be done with the inventive ink.

The inventive printing ink contains an optically variable material, for example liquid-crystal pigments or interference layer pigments, as well as at least one machine-readable feature substance. The optically variable pigments can have a body color if the print is to be rather opaque. In case information or color layers located therebelow are to remain visible, one uses translucent optically variable materials without body color.

The machine-readable feature substance may be luminescent substances transparent in the visible spectral region. Transparent feature substances offer the advantage of not impairing the visual color effect of the optically variable material and not appearing visually otherwise in any way. Since forgers generally confine themselves to imitating the visual impression of an object of value, these forgeries can be dis-

covered very easily by checking the machine-detectable property of the feature substance.

It is also possible to use magnetic pigments, in particular black magnetic pigments. The concentration of magnetic pigments must, however, be chosen so that the visual impression of the optically variable pigments is not impaired. If the magnetic pigments are added in low concentrations, they even support the optical effect of the optically variable pigments since they absorb the diffuse stray radiation.

Fig. 2 shows another embodiment of the inventive security element. In this case it is security thread 20 that, as already shown in Fig. 1, can be embedded in the bank note as a window security thread. It consists of carrier material 6 that can be transparent plastic material. Disposed on said carrier material is optically variable layer 7 containing feature substance 8. Optically variable layer 7 may be executed as a printed layer or likewise as a foil layer. In the case of a color layer, feature substance 8 can constitute the binder for example.

Fig. 3 shows another embodiment of inventive security element 21. In this case it is self-supporting foil 9 that has both the optically variable effect and feature substance 8. Said foil can be applied in the form of labels for product protection to any kind of object to be protected. It can alternatively also serve as a cover foil, for example for passports or ID cards. Foil 9 can also be cut into bands or threads of a certain width, however, that are fastened to a document of value or product, or embedded in a paper of value as a window thread.

Fig. 4 shows inventive transfer material 22 in whose layer structure the optically variable material and feature substance are disposed. It consists of carrier foil 10 that can be provided with separation layer 11 in order to permit the layer structure to be detached from the carrier band. Layer 12 can be formed as a foil layer or also as a printed layer and contains both feature substance 8 and the optically variable material. On layer 12 one may finally dispose adhesive layer 13, preferably a hot-melt adhesive layer. The layer sequence of transfer material 22 can of course be supplemented by additional layers depending on the application. If layer 12 is a printed layer, for example, it may be expedient to dispose another protective layer

between separation layer 11 and layer 12 in order to protect the security element from harmful environmental influences after transfer to the document of value.

A feature substance can likewise be incorporated into said protective layer. Another alternative provides for incorporating the feature substance only in said protective layer so that layer 12 contains only the optically variable material.

Said transfer material 22 is then contacted with the document of value to be protected and subjected to pressure and/or heat in the areas to be transferred so that the layer structure located on carrier material 10 bonds firmly with the document material and remains on the document when carrier material 10 is then removed.

Transfer material 22 can also be used analogously to above-described self-supporting foil 9 for protecting any other desired objects.

Fig. 5 shows document of value 14 with another embodiment of inventive security element 23 in cross section. Document of value 14 bears dark-colored print 16 containing feature substance. Printed image 16 can represent for example a coding or alphanumeric information. Disposed thereover in a large-surface area is optically variable material 15 having no or little body color. This may be for example liquid-crystal polymer material or also interference layer material, as sold under the trade name IRIODINE® by Merck. It is preferably admixed in the form of pigments to a printing ink or brushing paint that is applied to the document. The visual effect of optically variable material 15 stands out clearly in the area of dark printed image 16 while it is only very weakly recognized in the remaining areas due to the transparency of the optically variable material and the diffuse stray radiation that occurs.

Dark printed image 16 can be produced by means of a printing ink containing magnetic pigment, or a printing ink with another feature substance admixed thereto. This may be for example a black IR-transparent ink with one or more luminescent substances emitting in the IR spectral region admixed thereto. Alternatively, one can use a printing ink containing carbon black and having an electric conductivity easily tested by machine.

Additional protection can be obtained if printed image 16 consists of a machine-detectable printing ink only in certain areas. That is, parts of entire printed image 16 are printed with a dark ink containing neither magnetic pigment nor lumi-

nescent substance and the remaining parts are produced with the ink containing feature substance. This permits not only the existence of the feature substance to be detected in the area of the optically variable material during machine testing, but additionally its distribution evaluated.

The ink used for producing printed image 16 can of course also contain a plurality of feature substances, for example a mixture of magnetic pigments and luminescent substances. It is also possible to use a plurality of optically variable materials.

This embodiment according to Fig. 5 is especially advantageous if high-resolution images are to be produced with the aid of optically variable printing inks. Due to the necessary pigment size and the platelike shape of most optically variable materials, the latter cannot be printed in the form of fine, high-resolution patterns, for example guilloches with a line thickness smaller than 0.1 mm as a positive or negative printed image. They are therefore usually applied by screen printing. Fine line thicknesses of less than 0.1 mm, on the other hand, can usually be obtained only by offset, indirect letterpress or similar processes. The feature substances can now be processed with these printing processes so that inks with feature substances can be printed with high resolution. This has the consequence that the visual effect of the optically variable material nevertheless appears as a high-resolution pattern in the finished security element due to the dark background.

Alternatively, the high-resolution pattern can be printed with a conventional dark to black ink that is supplemented by an adjoining pattern containing feature substance. The layer containing feature substance is preferably transparent in this case.

Fig. 6 shows document of value 14 on which another embodiment of inventive security element 24 is disposed. Security element 24 consists of magnetic layer 32 containing carbon black components 17. Disposed on said layer is translucent optically variable layer 15 additionally containing luminescent substance 18. Luminescent substance 18 may be for example a luminescent substance transparent in the visible spectral region and emitting in the visible spectral region under UV illumination.

This easily produced security element has several properties testable by machine and visually. One can thus use for visual testing both the optically variable material and the emission of the luminescent substance excitable by UV light. For machine evaluation one can detect the magnetic properties and the luminescence emission under UV illumination. Additionally, one can evaluate the electric conductivity produced by the carbon black admixture.

Fig. 7 shows a similar embodiment of inventive security element 25. Here, too, magnetic layer 32 with admixed carbon black is first applied to document of value 14. On said layer one then provides layer 19 containing a luminescent substance emitting in the IR spectral region. Finally, one disposes thereover optically variable layer 15 transparent in the IR spectral region.

The layers shown in Figs. 6 and 7 do not have to be disposed congruently over each other, as shown in the figures. The magnetic layer can thus be applied in the form of a printed image, similarly to Fig. 5. The same applies to luminescent layer 19. The layers containing feature substances can also be disposed side by side, preferably directly adjacent to each other.

Fig. 8 shows another embodiment of inventive security element 26 wherein the feature substance is applied in the form of a coding. In the example shown, a layer containing feature substance is provided on document 14 in the form of a bar code that consists of spaced-apart areas 30. Intermediate areas 31 are filled with a layer containing no feature substance but visually showing the same appearance as areas 30. Over layers 30, 31 one disposes optically variable layer 15.

Such an embodiment is especially advantageous if the optically variable material is a quasi transparent interference-layer or liquid-crystal material whose color effect is strongly accentuated by a dark background. In this case the color effect of layer 15 is accentuated in the entire area of dark to black areas 30, 31 but not the entire area has feature substance. The feature substance used may be for example an IR-absorbent substance. Said substance may simultaneously be magnetic. Areas 31 are in this case preferably printed with an IR-transparent layer.

According to another embodiment, only areas 30 may be provided, i.e. areas 31 with a camouflaging effect in the visible spectral region may be omitted.

Fig. 9 shows a front view of a special embodiment of the inventive security element that combines the teachings and embodiments explained with reference to Figs. 5 and 8. Said security element 27 consists of a colored, preferably dark or black, print having in certain areas gaps 38 in the form of patterns or alphanumeric characters. In the area of print 36 there is additionally bar code 37 showing the same appearance under normal illumination conditions as print 36 so that bar code 37 is not to be recognized visually. In Fig. 9 bar code 37 has been accentuated in clearly recognizable fashion for reasons of clearness, however. Unlike print 36, the ink with which bar code 37 was produced contains a machine-detectable feature substance, preferably an IR-absorbent substance. The printed image composed of components 36, 37, 38 is covered all over by translucent layer 39, preferably a liquid-crystal layer. As explained above, the optically variable effect of layer 39 stands out clearly primarily in the area of prints 36, 37.

Security element 27 can be produced in different ways. Thus, prints 36, 37 can be printed in register side by side. That is, if print 36 is produced in the first printing cycle, the areas of bar codes 37 also remain unprinted in said printing cycle and form gaps in print 36. In the second printing cycle, bar code 37 is supplemented with ink containing feature substance. Alternatively, prints 36, 37 can be disposed one over the other. It must thereby be heeded that the ink of print 36 must not impair the machine-readability of bar code 37.

According to another variant, both print 36 and print 37 can contain a feature substance, the feature substances differing with respect to a physical property. One preferably uses IR-absorbent substances whose absorption peaks are in different spectral regions.

The security element can be designed more elaborately and thus also with higher forgery-proofness if the optically variable layer is composed of a plurality of optically variable materials with different physical properties. A special embodiment of such an optically variable layer is shown in Fig. 10. Fig. 10 only shows a front view of optically variable layer 39 shown in Fig. 9. In this case, optically variable layer 39 is composed of two materials with different properties. One of the optically variable materials is disposed in area 40 and the other in area 41. Area 41 has the

form of alphanumeric characters in the example shown. Areas 40, 41 can also have any other contour form, however.

One preferably produces areas 40, 41 using for liquid-crystal materials with different light-polarizing properties. Depending on the chemical composition of the liquid-crystal material, only light with a certain polarization is reflected. The chemical composition can be chosen so that two liquid-crystal materials look the same visually but reflect differently polarized light.

If areas 40, 41 shown in Fig. 10 are covered with such liquid-crystal materials the information represented by areas 41 cannot be recognized under normal viewing conditions. The information becomes recognizable only when layer 39 is viewed through a polarization filter passing only light of one polarization direction.

According to another embodiment, the liquid-crystal materials disposed in areas 40, 41 can additionally be provided with a feature substance, for example a luminescent substance. Both liquid-crystal materials can be provided with the same or different feature substances, such as two different luminescent or thermochromic substances. A luminescent and a thermochromic substance are also possible since the feature substances do not need to have the same testable property. If the security element is to have thermochromic properties, the liquid-crystal materials can also be chosen so as to have both different polarization properties and different thermochromic properties.

One can thus use for area 40 a liquid-crystal material having left-handed properties and showing a color change when subjected to body heat. At the same time the material is provided with a first luminescent substance transparent in the visible spectral region. Area 41, however, is covered with a right-handed liquid-crystal material that likewise shows a color change when subjected to body heat, but contrasts in color with that of the liquid-crystal material in area 40. Said second liquid-crystal material is also provided with a second luminescent substance transparent in the visible spectral region. The emission wavelengths of the two luminescent substances differ, however. This permits the information represented by areas 40, 41 and not recognizable under normal viewing conditions to be made visible or detected with the aid of polarization filters via the polarizing properties of the liquid-crystal mate-

rials, by heating via the thermochromic properties of the liquid crystals or by excitation of the emission of the luminescent substances.

This way of designing the optically variable layer explained with reference to Fig. 10 can of course also be used in all other embodiments explained.

It is likewise possible to provide the printed layer sequences shown in Figures 5, 6, 7, 8 and 9 on a security thread or in a transfer material. The transfer material can be formed either as a hot stamping foil or as label material.

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

International Patent Application
No. PCT/EP00/01428

PCT/DO/EO/US

International Filing Date: 22 February 2000

Applicant: Reinhard PLASCHKA et al.

Attorney Docket: PLAS3002/JEK

For: VALUE DOCUMENT

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Sir:

This is a national stage filing under 35 U.S.C. §371 of the above international patent application. The international application was not amended during International Preliminary Examination.

Before calculation of the filing fee and before examination, please amend the application as follows:

IN THE CLAIMS:

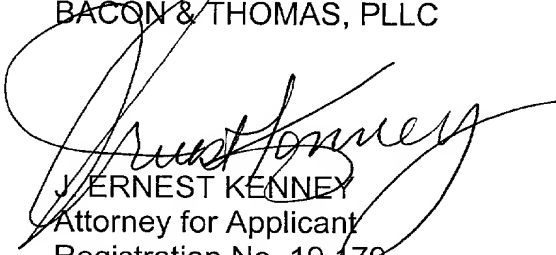
Please cancel claims 15, 18, 20, 24, 25, 26, 28, 3,32, 33 and 34 without prejudice or disclaimer.

Please amend the remaining claims as shown on the appended APPENDIX OF MARKED-UP OF CLAIMS. A clean copy of the amended claims is appended hereto in the APPENDIX OF CLAIMS.

REMARKS

The claims have been amended to place them in conformity with U.S. practice. It is not believed that any of the elements of the claims have been narrowed by the preliminary amendment, which is intended to facilitate examination of the application. Examination of the application as amended is requested.

Respectfully submitted,
BACON & THOMAS, PLLC


J. ERNEST KENNEY
Attorney for Applicant
Registration No. 19,179



Customer 23364

BACON & THOMAS, PLLC

625 Slaters Lane - 4th Floor
Alexandria, VA 22314-1176
Telephone: (703) 683-0500
Facsimile: (703) 683-1080

Date: August 22, 2001

S:\Producer\jek\PLASCHKA - PLAS3002\preliminary amendment.wpd

Sports

International Application No. PCT/EP00/01428
Attorney Docket: PLAS3002/JEK

APPENDIX OF MARKED-UP VERSION OF CLAIMS

1(Amended). A document of value (1, 14) such as a paper of value or ID card [with] comprising a security element (23, 24, 25, 26, 27) having at least one optically variable material (15, 39, 40, 41) that conveys different color effects at different viewing angles, and at least one machine-readable feature substance (16, 17, 18, 19, 30, 37) that does not impair [the] a visually visible optically variable effect of the optically variable material (4, 15), the feature substance (16, 17, 18, 19, 30, 37) being present in the form of a coding or alphanumeric information.

2(Amended). [A] The document of value (1, 14) according to claim 1, [characterized in that] wherein the security element (23, 24, 25, 26, 27) [consists of] comprises a printed image having a first printed layer (16, 37) containing the feature substance (17, 30, 32), said printed layer being in the form of the coding or alphanumeric information, and an optically variable material (15, 39, 40, 41) disposed over said printed layer (16, 37).

3(Amended). [A] The document of value according to claim [1 or] 2, [characterized in that] wherein the security element (26, 27) has a second printed layer (31, 36) containing no feature substance that is disposed in register with the first printed layer (16, 37) and shows the same visual appearance as the first printed layer (16, 37).

4(Amended). [A] The document of value (1, 14) according to [at least one of claims 1 to 3, characterized in that] claim 2, wherein the first printed layer has a dark, preferably black, color.

5(Amended). [A] The document of value (1, 14) according to [at least one of claims 1 to 4, characterized in that] claim 1, wherein the security element (23, 24, 25, 26, 27) has two liquid-crystal materials (40, 41) with different polarization properties.

6(Amended). A document of value (1, 14) such as a paper of value or ID card [with] comprising a security element (5) having at least one optically variable material that conveys different color effects at different viewing angles, and at least one machine-readable feature substance that does not impair [the] a visually visible optically variable effect of the optically variable material, the optically variable material and the feature substance being disposed in one layer (4) and said layer (4) being present in the form of information.

7(Amended). [A] The document of value (1, 14) according to claim 6, [characterized in that] wherein the layer (4) is present on the document of value (1) in the form of a print.

8(Amended). [A] The document of value (1, 14) according to claim 6 [or 7, characterized in that] , wherein the layer (4) has a binder of electrically conductive material and optically variable pigments dispersed therein.

9(Amended). [A] The document of value (1, 14) according to [at least one of claims 1 to 7, characterized in that] claim 1 or 6, wherein the security element (5, 23, 24, 25, 26, 27) is disposed on a plastic foil that is connected with the document of value (1, 14).

10(Amended). [A] The document of value (1, 14) such as a paper of value or ID card [with] comprising a security element (21) having at least one optically variable material that conveys different color effects at different viewing angles, and at least one machine-readable feature substance (8) that does not impair [the] a visually visible optically variable effect of the optically variable material, the optically variable material and the feature substance (8) being disposed in one layer and said layer being a self-supporting plastic foil (9).

11(Amended). [A] The document of value (1, 14) according to [at least one of claims 1 to 10, characterized in that] claim 10, wherein the plastic foil (9) is present in the form of a thread or band that is freely accessible at least partially on the surface of the document of value (1).

12(Amended). [A] The document of value (1) according to [at least one of claims 1 to 10, characterized in that] claim 10, wherein the plastic foil (9) is present in the form of a label that is applied to the document of value (1).

13(Amended). [A] The document of value (1, 14) according to [at least one of claims 1 to 10, characterized in that] claim 10, wherein the plastic foil (9) forms a cover foil of the document of value.

14(Amended). [A] The document of value (1, 14) according to [at least one of claims 1 to 13, characterized in that] claim 1, 6 or 10, wherein the optically variable material (4, 7, 9, 15) is a liquid-crystal material.

15(Canceled). [A document of value (1, 14) according to at least one of claims 1 to 14, characterized in that the optically variable material (4, 7, 9, 15) is a liquid-crystal polymer material or microencapsulated liquid-crystal material.]

16(Amended). [A] The document of value (1, 14) according to [at least one of claims 1 to 13, characterized in that] claim 1, 6 or 10, wherein the optically variable material (4, 7, 9, 15) is an interference layer material.

17(Amended). [A] The document of value (1, 14) according to [at least one of claims 1 to 16, characterized in that] claim 1, 6 or 10, wherein the optically variable material (4, 7, 9, 15) is selected from the group consisting of a pigment [or] and a particle with suitable size and shape factor.

18(Canceled). [A document of value (1, 14) according to at least one of claims 1 to 17, characterized in that the machine-readable feature substance (8, 18, 19) is transparent in the visible spectral region.]

19(Amended). [A] The document of value (1, 14) according to [at least one of claims 1 to 18, characterized in that] claim 1, 6 or 10, wherein the machine-readable feature substance (8, 19) is a material luminescing including a substance that is luminescent outside the visible spectral region.

20(Canceled). [A document of value (1, 14) according to claim 19, characterized in that the luminescent substance is an inorganic luminescent substance.]

21(Amended). [A] The document of value (1, 14) according to [at least one of claims 1 to 20, characterized in that] claim 1, 6 or 10, wherein the machine-readable feature substance (8) is an IR-absorbent material.

22(Amended). [A] The document of value (1, 14) according to [at least one of claims 1 to 21, characterized in that] claim 1, 6 or 10, wherein the security element is present on the document of value as a multilayer transfer element in whose layer structure the optically variable material and feature substance are disposed.

23(Amended). A foil (9) [having] comprising at least one optically variable material (7, 9, 15, 39, 40, 41) that conveys different color effects at different viewing angles, [characterized in that] wherein the foil (9) additionally has at least one machine-readable feature substance (8) that does not impair [the] a visually visible optically variable effect of the optically variable material.

24(Canceled). [A foil (9) according to claim 23, characterized in that the foil (9) consists of a polymer material in which optically variable pigments and the feature substance (8) are embedded.]

25(Canceled). [A foil (9) according to claim 23, characterized in that the foil (9) consists of a liquid-crystal or electrically conductive polymer material in which the feature substance (8) is embedded.]

26(Canceled). [A foil according to at least one of claims 23 to 25, characterized in that a security element (23, 24, 25, 26, 27) is disposed on the foil (9), said element consisting of a printed image having a first printed layer (16, 37) containing the feature substance (17, 30, 32), and an optically variable material (15, 39, 40, 41) disposed over said printed layer (16, 37).]

27(Amended). A multilayer transfer material (22) [having] comprising at least one optically variable material (12) that conveys different color effects at different viewing angles, [characterized in that] wherein the transfer material (22) additionally has at least one machine readable feature substance (8) that does not impair [the] a visually visible optically variable effect of the optically variable material (12).

28(Canceled). [A multilayer transfer material (22) according to claim 27, characterized in that the transfer material is formed as a hot stamping foil or label material.]

29(Amended). A printing ink [having] comprising at least one binder and one optically variable material that conveys different color effects at different viewing angles, [characterized in that] the printing ink additionally [has] including at least one machine-readable feature substance (8) that does not impair [the] a visually visible optically variable effect of the optically variable material.

30(Canceled). [A printing ink according to claim 29, characterized in that the printing ink contains optically variable pigments in 10 to 30 wt% and feature substance in 0.01 to 30 wt%, preferably 0.01 to 10 wt%, based on the binder.]

31(Amended). Plastics pellets, [characterized in that the plastic pellets have] comprising at least one optically variable material that conveys different color effects at different viewing angles and at least one machine-readable feature substance that does not impair [the] a visually visible optically variable effect of the optically variable material.

32(Canceled). [Use of a foil (9) according to at least one of claims 23 to 26 for producing security elements or documents of value.]

33(Canceled). [Use of a multilayer transfer material (22) according to claim 27 or 28 for producing security elements or documents of value.]

34(Canceled). [Use of a printing ink according to claim 29 for security printing, in particular printing papers of value.]

35(Amended). A method for testing a document of value made according to claim 1, [characterized in that] wherein the existence of the optically variable material is tested in a first step and the feature substance is tested in the area of the optically variable material in a second step.

International Application No. PCT/EP00/01428
Attorney Docket: PLAS3002/JEK

APPENDIX OF CLAIMS

1(Amended). A document of value (1, 14) such as a paper of value or ID card comprising a security element (23, 24, 25, 26, 27) having at least one optically variable material (15, 39, 40, 41) that conveys different color effects at different viewing angles, and at least one machine-readable feature substance (16, 17, 18, 19, 30, 37) that does not impair a visually visible optically variable effect of the optically variable material (4, 15), the feature substance (16, 17, 18, 19, 30, 37) being present in the form of a coding or alphanumeric information.

2(Amended). The document of value (1, 14) according to claim 1, wherein the security element (23, 24, 25, 26, 27) comprises a printed image having a first printed layer (16, 37) containing the feature substance (17, 30, 32), said printed layer being in the form of the coding or alphanumeric information, and an optically variable material (15, 39, 40, 41) disposed over said printed layer (16, 37).

3(Amended). The document of value according to claim 2, wherein the security element (26, 27) has a second printed layer (31, 36) containing no feature substance that is disposed in register with the first printed layer (16, 37) and shows the same visual appearance as the first printed layer (16, 37).

4(Amended). The document of value (1, 14) according to claim 2, wherein the first printed layer has a dark, preferably black, color.

5(Amended). The document of value (1, 14) according to claim 1, wherein the security element (23, 24, 25, 26, 27) has two liquid-crystal materials (40, 41) with different polarization properties.

6(Amended). A document of value (1, 14) such as a paper of value or ID card comprising a security element (5) having at least one optically variable material that

conveys different color effects at different viewing angles, and at least one machine-readable feature substance that does not impair a visually visible optically variable effect of the optically variable material, the optically variable material and the feature substance being disposed in one layer (4) and said layer (4) being present in the form of information.

7(Amended). The document of value (1, 14) according to claim 6, wherein the layer (4) is present on the document of value (1) in the form of a print.

8(Amended). The document of value (1, 14) according to claim 6, wherein the layer (4) has a binder of electrically conductive material and optically variable pigments dispersed therein.

9(Amended). The document of value (1, 14) according to claim 1 or 6, wherein the security element (5, 23, 24, 25, 26, 27) is disposed on a plastic foil that is connected with the document of value (1, 14).

10(Amended). The document of value (1, 14) such as a paper of value or ID card comprising a security element (21) having at least one optically variable material that conveys different color effects at different viewing angles, and at least one machine-readable feature substance (8) that does not impair a visually visible optically variable effect of the optically variable material, the optically variable material and the feature substance (8) being disposed in one layer and said layer being a self-supporting plastic foil (9).

11(Amended). The document of value (1, 14) according to claim 10, wherein the plastic foil (9) is present in the form of a thread or band that is freely accessible at least partially on the surface of the document of value (1).

12(Amended). The document of value (1) according to claim 10, wherein the plastic foil (9) is present in the form of a label that is applied to the document of value (1).

13(Amended). The document of value (1, 14) according to claim 10, wherein the plastic foil (9) forms a cover foil of the document of value.

14(Amended). The document of value (1, 14) according to claim 1, 6 or 10, wherein the optically variable material (4, 7, 9, 15) is a liquid-crystal material.

15(Canceled).

16(Amended). The document of value (1, 14) according to claim 1, 6 or 10, wherein the optically variable material (4, 7, 9, 15) is an interference layer material.

17(Amended). The document of value (1, 14) according to claim 1, 6 or 10, wherein the optically variable material (4, 7, 9, 15) is selected from the group consisting of a pigment and a particle with suitable size and shape factor.

18(Canceled).

19(Amended). The document of value (1, 14) according to claim 1, 6 or 10, wherein the machine-readable feature substance (8, 19) is a material luminescing including a substance that is luminescent outside the visible spectral region.

20(Canceled).

21(Amended). The document of value (1, 14) according to claim 1, 6 or 10, wherein the machine-readable feature substance (8) is an IR-absorbent material.

22(Amended). The document of value (1, 14) according to claim 1, 6 or 10, wherein the security element is present on the document of value as a multilayer transfer element in whose layer structure the optically variable material and feature substance are disposed.

23(Amended). A foil (9) comprising at least one optically variable material (7, 9, 15, 39, 40, 41) that conveys different color effects at different viewing angles, wherein the foil (9) additionally has at least one machine-readable feature substance (8) that does not impair a visually visible optically variable effect of the optically variable material.

24(Canceled).

25(Canceled).

26(Canceled).

27(Amended). A multilayer transfer material (22) comprising at least one optically variable material (12) that conveys different color effects at different viewing angles, wherein the transfer material (22) additionally has at least one machine readable feature substance (8) that does not impair a visually visible optically variable effect of the optically variable material (12).

28(Canceled).

29(Amended). A printing ink comprising at least one binder and one optically variable material that conveys different color effects at different viewing angles, the printing ink additionally including at least one machine-readable feature substance (8) that does not impair a visually visible optically variable effect of the optically variable material.

30(Canceled).

31(Amended). Plastics pellets, comprising at least one optically variable material that conveys different color effects at different viewing angles and at least one machine-readable feature substance that does not impair a visually visible optically variable effect of the optically variable material.

32(Canceled).

33(Canceled).

34(Canceled).

35(Amended). A method for testing a document of value made according to claim 1, wherein the existence of the optically variable material is tested in a first step and the feature substance is tested in the area of the optically variable material in a second step.

Patent claims

1. A document of value (1, 14) such as a paper of value or ID card with a security element (23, 24, 25, 26, 27) having at least one optically variable material (15, 39, 40, 41) that conveys different color effects at different viewing angles, and at least one machine-readable feature substance (16, 17, 18, 19, 30, 37) that does not impair the visually visible optically variable effect of the optically variable material (4, 15), the feature substance (16, 17, 18, 19, 30, 37) being present in the form of a coding or alphanumeric information.

2. A document of value (1, 14) according to claim 1, characterized in that the security element (23, 24, 25, 26, 27) consists of a printed image having a first printed layer (16, 37) containing the feature substance (17, 30, 32), said printed layer being in the form of the coding or alphanumeric information, and an optically variable material (15, 39, 40, 41) disposed over said printed layer (16, 37).

3. A document of value according to claim 1 or 2, characterized in that the security element (26, 27) has a second printed layer (31, 36) containing no feature substance that is disposed in register with the first printed layer (16, 37) and shows the same visual appearance as the first printed layer (16, 37).

4. A document of value (1, 14) according to at least one of claims 1 to 3, characterized in that the first printed layer has a dark, preferably black, color.

5. A document of value (1, 14) according to at least one of claims 1 to 4, characterized in that the security element (23, 24, 25, 26, 27) has two liquid-crystal materials (40, 41) with different polarization properties.

6. A document of value (1, 14) such as a paper of value or ID card with a security element (5) having at least one optically variable material that conveys different color effects at different viewing angles, and at least one machine-readable feature substance that does not impair the visually visible optically variable effect of the optically variable material, the optically variable material and the feature substance being disposed in one layer (4) and said layer (4) being present in the form of information.

7. A document of value (1, 14) according to claim 6, characterized in that the layer (4) is present on the document of value (1) in the form of a print.

8. A document of value (1, 14) according to claim 6 or 7, characterized in that the layer (4) has a binder of electrically conductive material and optically variable pigments dispersed therein.

9. A document of value (1, 14) according to at least one of claims 1 to 7, characterized in that the security element (5, 23, 24, 25, 26, 27) is disposed on a plastic foil that is connected with the document of value (1, 14).

10. A document of value (1, 14) such as a paper of value or ID card with a security element (21) having at least one optically variable material that conveys different color effects at different viewing angles, and at least one machine-readable feature substance (8) that does not impair the visually visible optically variable effect of the optically variable material, the optically variable material and the feature substance (8) being disposed in one layer and said layer being a self-supporting plastic foil (9).

11. A document of value (1, 14) according to at least one of claims 1 to 10, characterized in that the plastic foil (9) is present in the form of a thread or band that is freely accessible at least partially on the surface of the document of value (1).

12. A document of value (1) according to at least one of claims 1 to 10, characterized in that the plastic foil (9) is present in the form of a label that is applied to the document of value (1).

13. A document of value (1, 14) according to at least one of claims 1 to 10, characterized in that the plastic foil (9) forms a cover foil of the document of value.

14. A document of value (1, 14) according to at least one of claims 1 to 13, characterized in that the optically variable material (4, 7, 9, 15) is a liquid-crystal material.

15. A document of value (1, 14) according to at least one of claims 1 to 14, characterized in that the optically variable material (4, 7, 9, 15) is a liquid-crystal polymer material or microencapsulated liquid-crystal material.

16. A document of value (1, 14) according to at least one of claims 1 to 13, characterized in that the optically variable material (4, 7, 9, 15) is an interference layer material.

17. A document of value (1, 14) according to at least one of claims 1 to 16, characterized in that the optically variable material (4, 7, 9, 15) is a pigment or a particle with suitable size and shape factor.

18. A document of value (1, 14) according to at least one of claims 1 to 17, characterized in that the machine-readable feature substance (8, 18, 19) is transparent in the visible spectral region.

19. A document of value (1, 14) according to at least one of claims 1 to 18, characterized in that the machine-readable feature substance (8, 19) is a material luminescing outside the visible spectral region.

20. A document of value (1, 14) according to claim 19, characterized in that the luminescent substance is an inorganic luminescent substance.

21. A document of value (1, 14) according to at least one of claims 1 to 20, characterized in that the machine-readable feature substance (8) is an IR-absorbent material.

22. A document of value (1, 14) according to at least one of claims 1 to 21, characterized in that the security element is present on the document of value as a multilayer transfer element in whose layer structure the optically variable material and feature substance are disposed.

23. A foil (9) having at least one optically variable material (7, 9, 15, 39, 40, 41) that conveys different color effects at different viewing angles, characterized in that the foil (9) additionally has at least one machine-readable feature substance (8) that does not impair the visually visible optically variable effect of the optically variable material.

24. A foil (9) according to claim 23, characterized in that the foil (9) consists of a polymer material in which optically variable pigments and the feature substance (8) are embedded.

25. A foil (9) according to claim 23, characterized in that the foil (9) consists of a liquid-crystal or electrically conductive polymer material in which the feature substance (8) is embedded.

26. A foil according to at least one of claims 23 to 25, characterized in that a security element (23, 24, 25, 26, 27) is disposed on the foil (9), said element consisting of a printed image having a first printed layer (16, 37) containing the feature substance (17, 30, 32), and an optically variable material (15, 39, 40, 41) disposed over said printed layer (16, 37).

27. A multilayer transfer material (22) having at least one optically variable material (12) that conveys different color effects at different viewing angles, characterized in that the transfer material (22) additionally has at least one machine-readable feature substance (8) that does not impair the visually visible optically variable effect of the optically variable material (12).

28. A multilayer transfer material (22) according to claim 27, characterized in that the transfer material is formed as a hot stamping foil or label material.

29. A printing ink having at least one binder and one optically variable material that conveys different color effects at different viewing angles, characterized in that the printing ink additionally has at least one machine-readable feature substance (8) that does not impair the visually visible optically variable effect of the optically variable material.

30. A printing ink according to claim 29, characterized in that the printing ink contains optically variable pigments in 10 to 30 wt% and feature substance in 0.01 to 30 wt%, preferably 0.01 to 10 wt%, based on the binder.

31. Plastics pellets, characterized in that the plastic pellets have at least one optically variable material that conveys different color effects at different viewing angles and at least one machine-readable feature substance that does not impair the visually visible optically variable effect of the optically variable material.

32. Use of a foil (9) according to at least one of claims 23 to 26 for producing security elements or documents of value.

33. Use of a multilayer transfer material (22) according to claim 27 or 28 for producing security elements or documents of value.

35. A method for testing a document of value according to claim 1, characterized in that the existence of the optically variable material is tested in a first step and the feature substance is tested in the area of the optically variable material in a second step.

1/5

FIG. 1

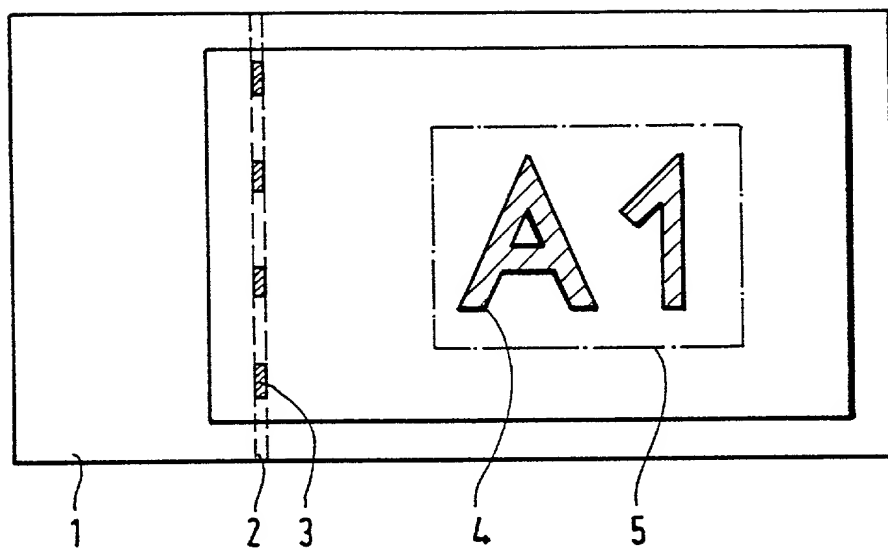


FIG. 2

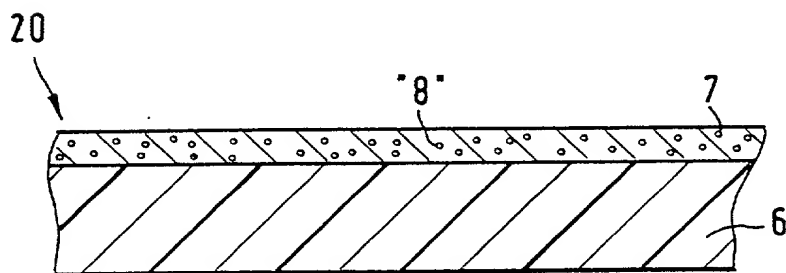
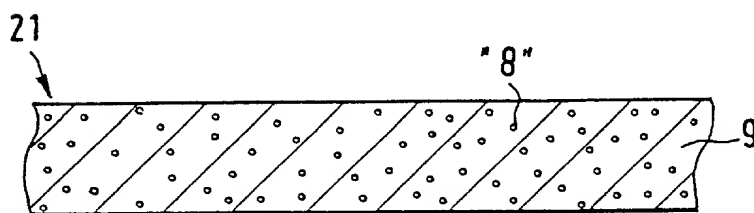


FIG. 3



2/5

FIG. 4

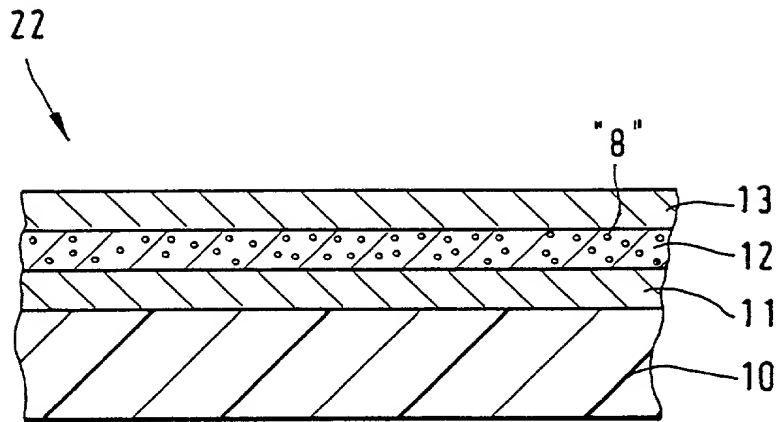
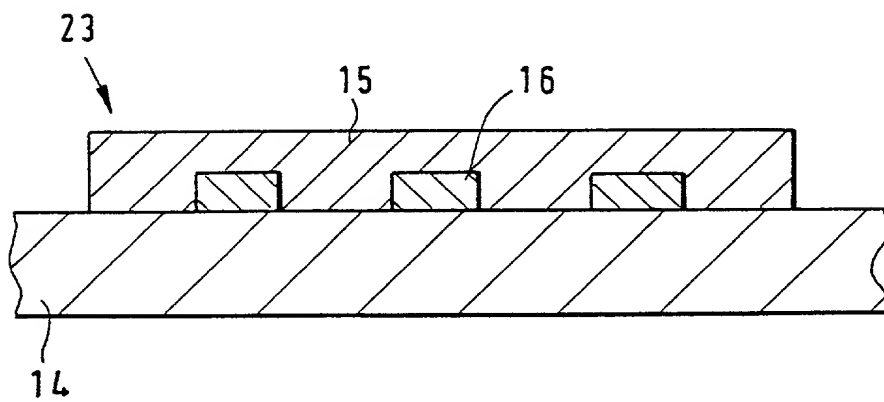


FIG. 5



3/5

FIG. 6

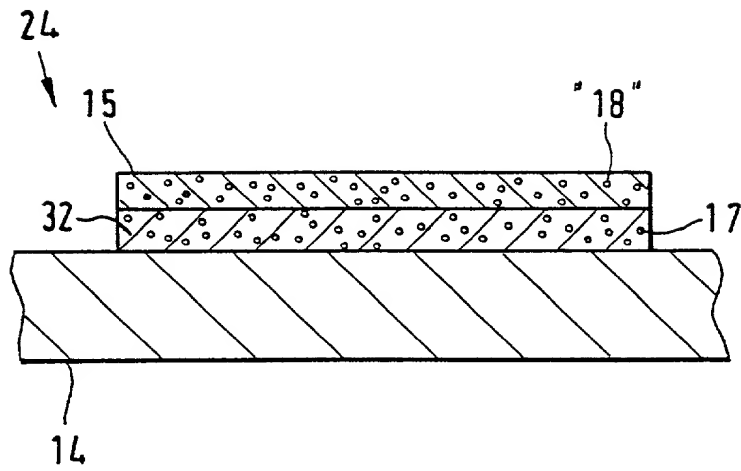
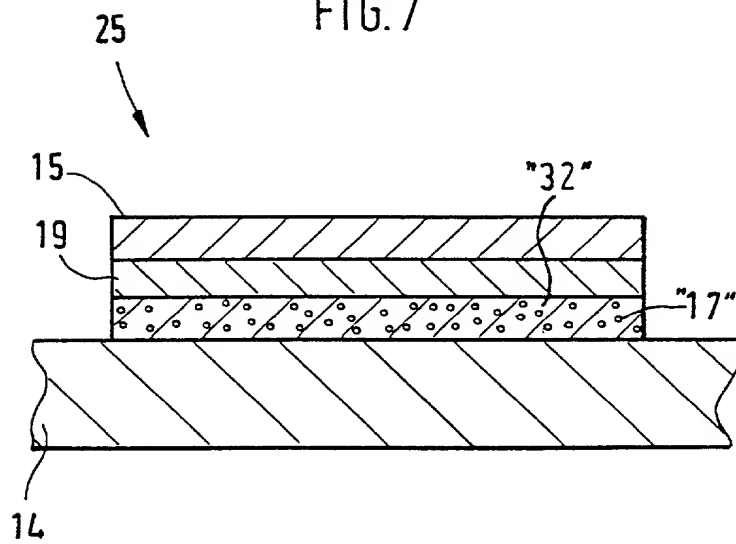


FIG. 7



4/5

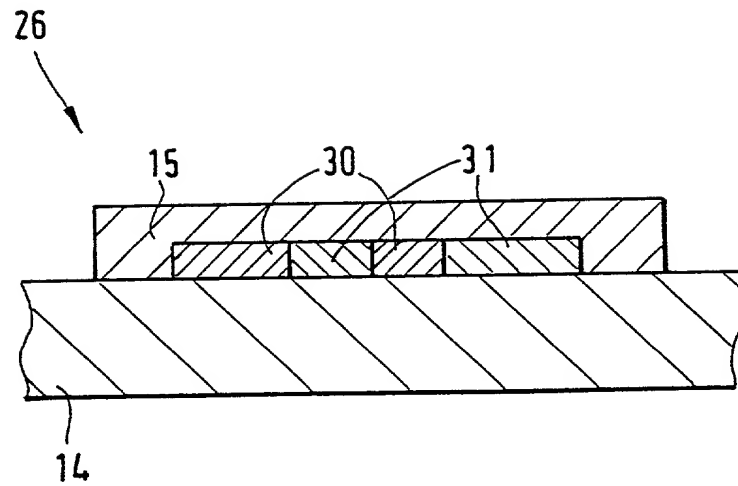


FIG. 8

5 / 5

FIG.9

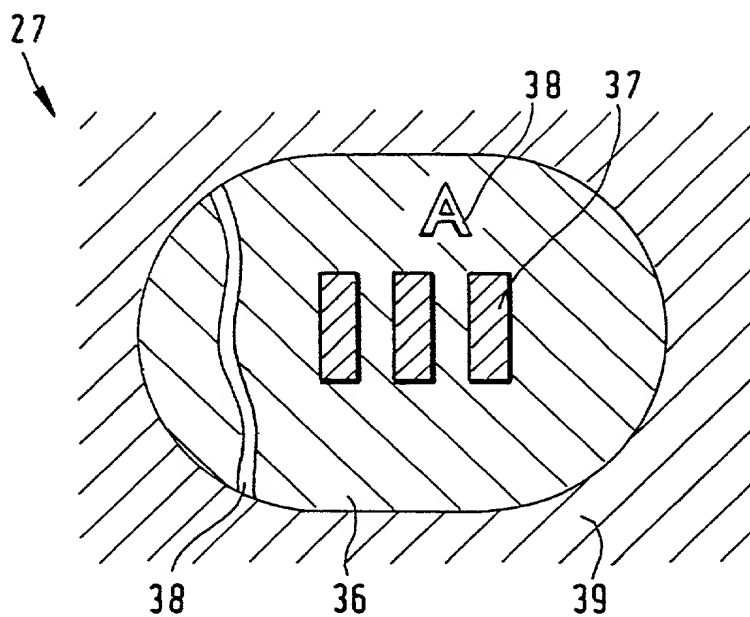
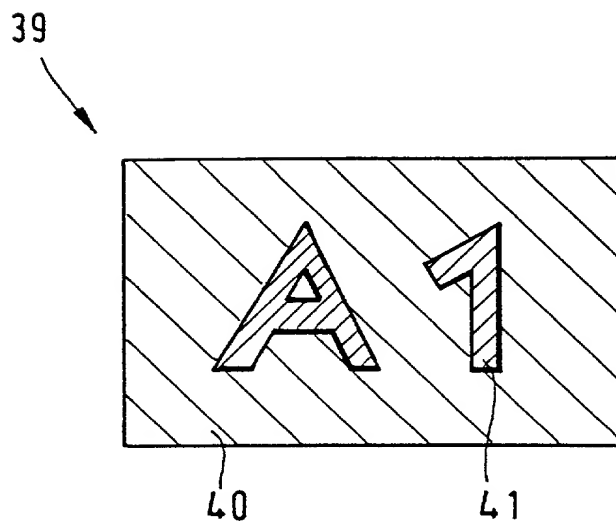


FIG.10



Rec'd PCT/PTO 19 NOV 2001 09/926062 77/145

DECLARATION FOR PATENT APPLICATION AND APPOINTMENT OF ATTORNEY

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name; I believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention (Design, if applicable) entitled:

VALUE DOCUMENT

the specification of which (check one):

☐ is attached hereto, or ☒ was filed on: **22 February 2000**

as U.S. Application Number or PCT

International Application Number: **PCT/EP00/01428 09/926,062**

and (if applicable) was amended on:

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment(s) referred to above. I acknowledge the duty to disclose information which is material to patentability as defined in *Title 37, Code of Federal Regulations, §1.56*. I hereby claim foreign priority benefits under *Title 35, United States Code §119* of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

PRIOR FOREIGN APPLICATION(S)			PRIORITY CLAIMED	
Number	Country	Day/Month/Year Filed	Yes	No
199 07 697.9	Germany	23 February 1999	X	

☐ Additional Priority Application(s) Listed on Following Page(s)

I HEREBY CLAIM THE BENEFIT UNDER TITLE 35 U.S. CODE §119(E) OF ANY U.S. PROVISIONAL APPLICATIONS LISTED BELOW.

Application Number	Day/Month/Year Filed

☐ Additional Provisional Application(s) Listed on Following Page(s)

I hereby claim the benefit under *Title 35, United States Code, §120* of any United States application(s) or PCT international application(s) designating The United States of America listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of *Title 35, United States Code, §112*, I acknowledge the duty to disclose information which is material to patentability as defined in *Title 37, Code of Federal Regulations, §1.56* which became available between the filing date of the prior application(s) and the national or PCT international filing date of this application:

Application Number	Filing Date	Status - Patented, Pending or Abandoned

☐ Additional US/PCT Priority Application(s) listed on Following Page(s)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: I (We) hereby appoint as my (our) attorneys, with full powers of substitution and revocation, to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: J. Ernest Kenney, Reg. No. 19,179; Eugene Mar, Reg. No. 25,893; Richard E. Fichter, Reg. No. 26,382; Thomas J. Moore, Reg. No. 28,974; Joseph DeBenedictis, Reg. No. 28,502; Benjamin E. Urcia, Reg. No. 33,805; and

I(we) authorize my(our) attorneys to accept and follow instructions from Klunker Schmitt-Nilson Hirsch regarding any matter related to the preparation, examination, grant and maintenance of this application, any continuation, continuation-in-part or divisional based thereon, and any patent resulting therefrom, until I(we) or my(our) assigns withdraw this authorization in writing.

Send correspondence to:



Customer 23364

BACON & THOMAS, PLLC

625 Slaters Lane - 4th Floor
Alexandria, VA 22314-1176Telephone Calls to: J. Ernest Kenney
(703) 683-0500

FULL NAME OF FIRST OR SOLE INVENTOR Reinhard PLASCHKA	CITIZENSHIP Germany
RESIDENCE ADDRESS Lindenstrasse 6, D-86949 Windach, Germany	POST OFFICE ADDRESS IS THE SAME AS RESIDENCE ADDRESS UNLESS OTHERWISE SHOWN BELOW
DATE 10/15/01	SIGNATURE <i>Reinhard Plaschka</i>

☒ See following page(s) for additional joint inventors.

5104721 US

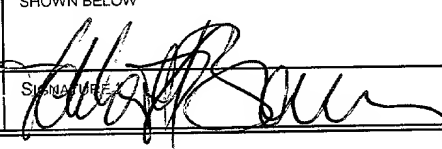
CONTINUATION OF DECLARATION FOR PATENT APPLICATION AND APPOINTMENT OF ATTORNEY

PRIOR FOREIGN APPLICATION(S) (35 USC §119)			PRIORITY CLAIMED	
Number	Country	Day/Month/Year Filed	Yes	No


PRIOR PROVISIONAL APPLICATIONS 35 U.S. CODE §119(E)	
Application Number	Day/Month/Year Filed

PRIOR U.S. OR PCT INTERNATIONAL APPLICATIONS (35 U.S. CODE §120)		
Application Number	Filing Date	Status - Patented, Pending or Abandoned

20

FULL NAME OF JOINT INVENTOR Eckhard BRAUN	CITIZENSHIP Germany
RESIDENCE ADDRESS Stilfser-Joch-Strasse 7, D-81547 Munchen, Germany	POST OFFICE ADDRESS IS THE SAME AS RESIDENCE ADDRESS UNLESS OTHERWISE SHOWN BELOW
DATE November 3, 2001	SIGNATURE 

300

FULL NAME OF JOINT INVENTOR Wittich KAULE	CITIZENSHIP Germany
RESIDENCE ADDRESS Lindacher Weg 13, D-82275 Emmering, Germany	POST OFFICE ADDRESS IS THE SAME AS RESIDENCE ADDRESS UNLESS OTHERWISE SHOWN BELOW
DATE October 29, 2001	SIGNATURE 

FULL NAME OF JOINT INVENTOR	CITIZENSHIP
RESIDENCE ADDRESS	POST OFFICE ADDRESS IS THE SAME AS RESIDENCE ADDRESS UNLESS OTHERWISE SHOWN BELOW
DATE	SIGNATURE

FULL NAME OF JOINT INVENTOR	CITIZENSHIP
RESIDENCE ADDRESS	POST OFFICE ADDRESS IS THE SAME AS RESIDENCE ADDRESS UNLESS OTHERWISE SHOWN BELOW
DATE	SIGNATURE

☐ See following pages for additional joint inventors/priority applications.